12. Information Presentation

12.1 Text Information

12.1.1 Text Font, Size, and Style

As indicated in section 7.2.3, users are expected to select the font for displaying text in user interface components as a system-level preference setting. When the application has a choice of fonts (e.g., for text in charts and on tactical displays), it uses a sans serif font of sufficient thickness and size to be readable when users are seated at a normal viewing distance from the screen. The DoD style guide indicates that at a minimum, character height should be 1/200 of viewing distance (e.g., a viewing distance of 36 inches requires a .18 inch character height on the screen). If desired, the application can use a bold font to ensure that the text is readable when presented normally or grayed out even if screen resolution is degraded.[1]

12.1.2 Capitalization, Grammar, and Punctuation

Text is presented in mixed case, following standard capitalization rules. Upper-case letters are used for acronyms and abbreviations and for emphasis. Arabic rather than Roman numerals are used when information has to be numbered.

Continuous text (e.g., directions, messages to users) is phrased in simple sentences, in the affirmative (rather than negative), and in active (rather than passive) voice. A sequence of events or steps is presented in the order they are performed. The referent for "it" or "they" in a sentence is easily identified. Normal punctuation rules are followed, and contractions and hyphenation are avoided. Paragraphs are kept short and separated by at least one blank line.

12.1.3 Acronyms and Abbreviations

Acronyms and abbreviations are used only when they are significantly shorter than the full word and are commonly understood by users (e.g., are related to normal language or are specific job-related terminology). Abbreviations are the shortest possible that will ensure uniqueness. Abbreviations are used consistently within the application. Words not commonly abbreviated are not abbreviated. MIL-STD 1472E indicates that acronyms and abbreviations are to conform to standards such as MIL-STD 783D.

12.1.4 Formats for Date/Time and Latitude/Longitude

The application uses the following formats when presenting date and time information.[2]

- Date is displayed as YYYYMMDD, where YYYY is the year, MM is the month, and DD is the day, or as DD MMM YYYY, where DD is the day, MMM is the month, and YYYY is the year. In the former format, year, month, and day are all digits, and leading zeros are included

[1] The MS Windows style guide recommends that the text in windows be displayed in nonbold font and that bolding be used only to call user attention to an area.
[2] The date/time formats have been updated for Year 2000 compliance.

as needed. In the latter format, month is indicated in capital letters, and leading zeros are included as needed.

- Time is displayed as HHMM[SS]Z, where HH is the hour of a 24-hour day, MM is the minute, SS (optional) is the second, and Z is the time zone. Zulu (i.e., Z), or Greenwich Mean Time, is the default time zone. The application provides users with the option to select other time zones as required. Leading zeros are included as needed (e.g., 090436Z). If desired, the application can include colons and/or spaces as part of the output format to improve readability.

- Date/Time Group is displayed as DDHHMMZ MMM YYYY, where DD is the day, HH is the hour, MM is the minute, Z is the time zone (Zulu is the default), MMM is the month, and YYYY is the year. Month is indicated in capital letters, and leading zeros are included as needed.

The application the following formats when presenting latitude and longitude information. If the application presents latitude and longitude together, latitude precedes (either above or to the left of) longitude. The application uses the appropriate symbols for degrees, minutes, and seconds as part of the output format to improve readability.

- Latitude is displayed as D{D}H, where D (one or two characters) is the degrees of latitude and H is the hemisphere (N for North, S for South), or as DD{MM{SS}}H, where DD is the degrees of latitude, MM is the minutes of latitude (optional), SS is the seconds of latitude (optional, but can only be given if minutes of latitude is given), and H is the hemisphere (N for North, S for South).

- Longitude is displayed as D{D{D}}H, where D (one, two, or three characters) is the degrees of longitude and H is the hemisphere (E for East, W for West), or as DDD{MM{SS}}H, where DDD is the degrees of longitude, MM is the minutes of longitude (optional), SS is the seconds of longitude (optional, but can only be given if minutes of longitude is given), and H is the hemisphere (E for East, W for West).

12.1.5 Wild Card Characters in Text Searches

If the application allows users to enter wild card characters to search for specific text patterns, it uses the following wild card conventions:

- @ searches for the occurrence of a single upper- or lower-case alphabetic character. For example, abc@d retrieves the strings abcad, abced, and abczd but not abc7d and abcddd.

- # searches for the occurrence of a single numeric character. For example, 123#4 retrieves the strings 12334, 12394, and 12304 but not 123x4 and 123554.

- ? searches for the occurrence of a single alphanumeric character (a-z, A-Z, 0-9, and punctuation marks). For example, abc?d retrieves the strings abcad, abcAd, abc(d, and abc9d but not abcxxd.

- * searches for the occurrence of zero or more alphanumeric characters. For example, abc*d retrieves the strings abcad, abcd, abfklsmd, and abc7d but not abcd5.

12.1.6 Tabular Information

When information is presented in tabular form, each column has a heading, and the content in one column is clearly separated from that in other columns (usually by at least four character spaces). Data groupings are indicated with blank space, separator lines, and/or different intensity levels; multiple colors are used only if they provide additional meaning.

Alphabetic information is left-justified within a column, numeric information without decimals is right-justified, and numeric information with decimals is justified by the decimal point. Long strings of numbers are delimited with spaces or commas, and leading zeros are not used unless required for clarity. If the information extends beyond a single line, additional lines are indented to indicate they are continuations.

Tabular information can be presented in sequential, spatial, alphabetical, functional, or chronological order. Information that is particularly important, requires immediate user response, and/or is used more frequently is presented first. If tabular information is presented in a scrollable area, the row and column headings are placed outside the area so that they remain visible when scrolling occurs. Whenever possible, the information is arranged so that it can be viewed without scrolling horizontally. Column headings can be displayed as buttons in order to support sorting; e.g., clicking on the heading sorts the records in the table based on the values in that column.

12.2 Graphical Information

12.2.1 Line Graphs and Surface Charts

A line graph, shown in figure 12-1, is used to present trend information, spatially structured information, time-critical information, or relatively imprecise information. The axes of the graph are labeled and include the unit of measurement as appropriate. The minimum and maximum value are indicated on each axis, with up to nine intermediate markings showing gradations on the axis. The starting point on each axis is zero, with the gradations indicated in whole numbers, unless a zero starting point is inappropriate for the data being displayed. The gradations are at standard intervals (e.g., 1, 2, 5, 10), with intervening gradations consistent with the scale interval.

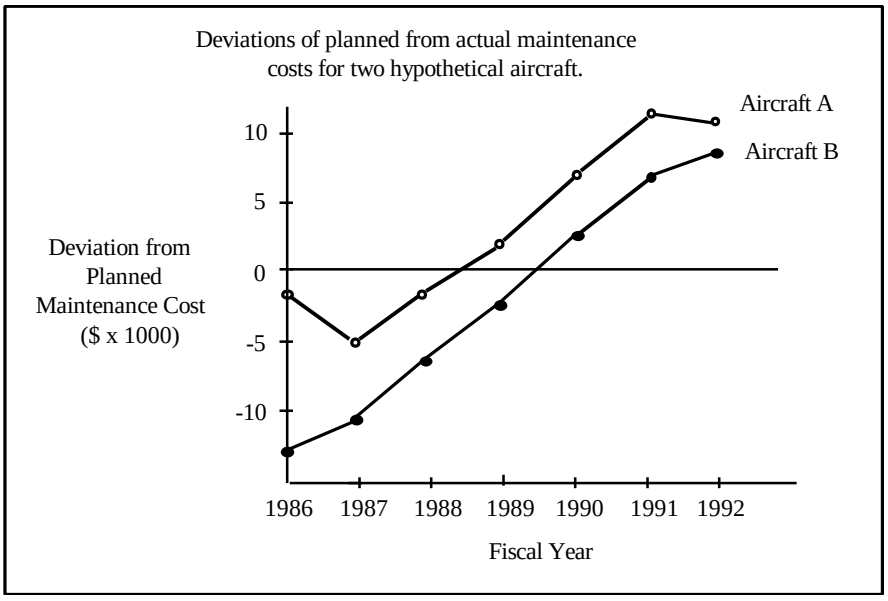

Figure 12-1. Example line graph.

A line graph contains no more than five lines, with each one identified by an adjacent label (rather than in a separate legend). The labels are oriented for normal reading and located next to the data being referenced. Critical or abnormal information is highlighted (e.g., by color, line thickness, annotation) to draw attention to it. If grid lines are included in the graph, they are unobtrusive and do not obscure the data plotted; users can display or suppress grid lines as desired.

If users are required to compare multiple lines, they are presented on a single graph. If related data have to be presented in multiple graphs, the same coding scheme is used on each graph, and users can redraw the graphs using the same scale to facilitate comparison. If users have to read precise values from a graph, they can display the actual data values on the graph and zoom the graph if necessary. The graph includes aids for scale interpretation (e.g., displays a grid upon request, provides vertical and horizontal rules that users can move to the intersection point).

A surface chart is a type of line graph in which the data being depicted represent all parts of a whole. The lines are stacked above one another to indicate aggregated amounts, and the area between each line is coded using different colors, shadings, or textures and labeled. The data categories are ordered to reflect the logical organization of the entity being displayed; if no a priori organization exists, the data categories are ordered so that the least variable ones are at the bottom and the most variable at the top.

12.2.2 Bar Charts

A bar chart, shown in figure 12-2, is used to compare a single measure at several intervals. The bars are oriented either vertically or horizontally, and bars containing data to be compared are presented adjacent to one another. Frequency counts are usually displayed in vertical bars, and time durations in horizontal bars. If the displayed data have to be compared with a critical value, a reference index is provided.

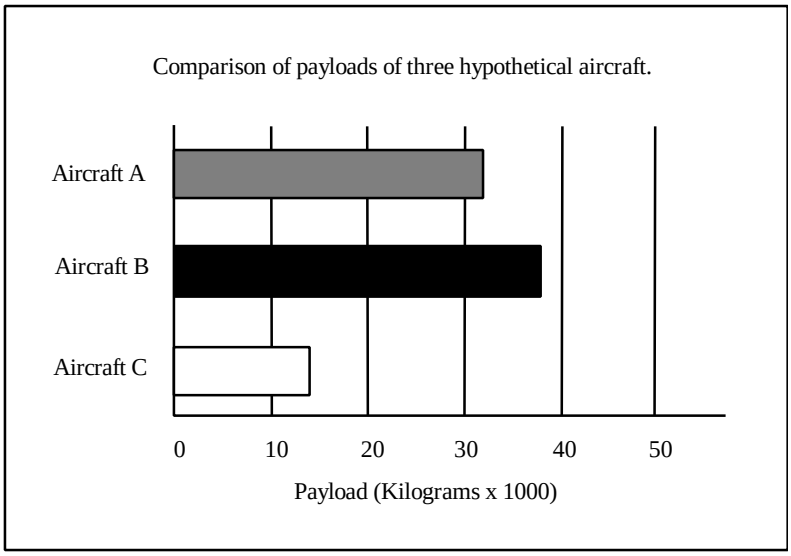

Figure 12-2. Example bar chart.

If the number of bars being displayed is small, they are separated, using one-half or less of the bar width as the spacing between them. If the number of bars is large, they are placed adjacent to each other. Coding (e.g., color, shading, texture) is used to distinguish among different groups of bars or to highlight important data in one or more of the bars. Related groups of bars are presented in a consistent order across multiple charts. If the bars are presented individually, each is labeled; if the bars are presented in pairs, they are labeled as a unit, with a legend provided that identifies each bar.

Stacked bars are used to display the total measures and the portions represented by each part of the whole. The data categories are presented in the same sequence in each bar. As with surface charts, data categories are ordered so that the least variable are at the bottom of the bar and the most variable are at the top. The areas within each bar are coded using different colors, shading, or texture and labeled.

12.2.3 Flow Charts

A flow chart is used to present a schematic representation of the decision points in a sequence or process. The path indicated in the flow chart is left to right, top to bottom, or clockwise. Each point identifies a single decision, as shown in figure 12-3. The elements and lines are coded (e.g., symbol and shape coding) and include directional indicators (arrows) to identify the sequence to be followed. A legend describes each element and code used in the flow chart, and the text in the chart is oriented for normal reading.

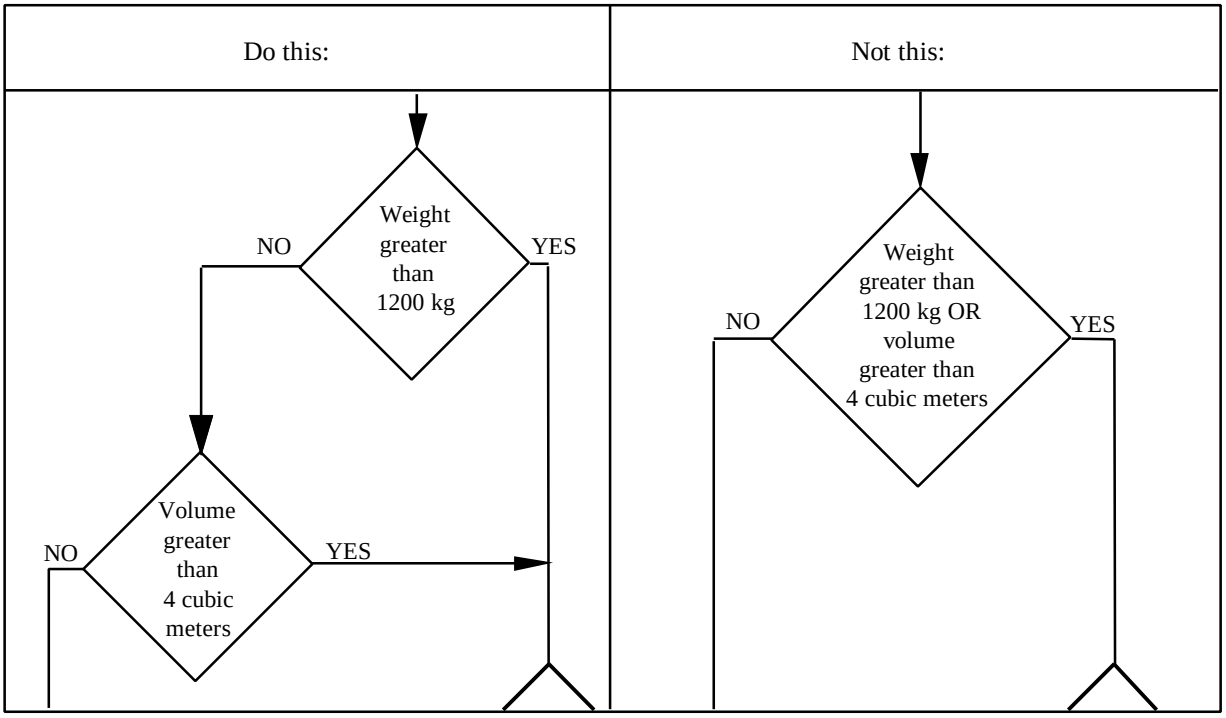

Figure 12-3. Example of labeling decision points in a flow chart.

The steps in a flow chart are ordered logically (i.e., follow the steps in the sequence or process from start to finish), or the most important decisions or the decisions that can be made with the greatest certainty are placed first. If no ordering scheme can be identified, the flow chart is structured to minimize the length of the path through it. Important elements (e.g., paths through the chart) and critical information are highlighted.

12.2.4 Pie Charts

A pie chart, shown in figure 12-4, is used to provide an approximation of how an entity is apportioned into component parts. Each segment in the chart is coded using different colors, shadings, or textures and labeled. If the segment is too small to contain the label, it is placed outside the segment, with a line from it to the segment. The label describes the content of the segment, includes the number (i.e., percentage or actual value) being represented by the segment, and is oriented for normal reading. Important segments are highlighted by using special shading and by displacing them slightly from the remainder of the pie chart.

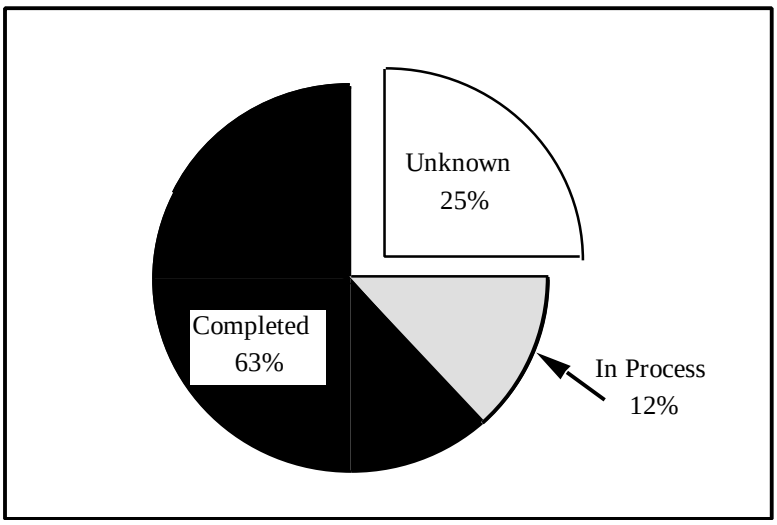

Figure 12-4. Example pie chart.

12.2.5 Graphic Schedules

A graphic schedule, shown in figure 12-5, is used to present the time sequence for a series of tasks. Time is presented on the horizontal axis and the tasks to be performed are arrayed vertically. A task can be decomposed into events which are represented as icons on the schedule. The length of each icon is proportional to the amount of time necessary to complete the task. The icon is displayed to the right of its associated task.

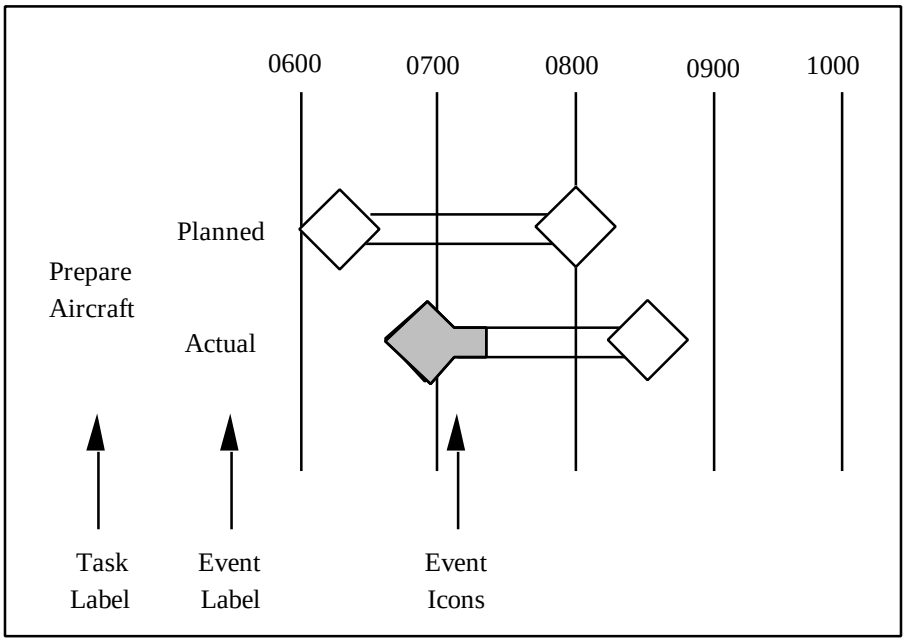

Figure 12-5. Example graphical schedule.

If a task includes more than one event, each of the icons is labeled, and the labels are placed along the vertical axis or on or above the timeline. If appropriate, different scheduling attributes can be represented as symbols with the event icons. These symbols can be formed from various geometric shapes (e.g., circles, diamonds, squares) and coded (e.g., using different fill patterns) to indicate various schedule situations. If different types of events (e.g., ones undertaken at different locations) are presented, they are differentiated by color or shading or include an alphanumeric designator displayed on or above the icon for the event. If a coding scheme is used, a legend describing the coding technique is included with the schedule.

No more than nine uniquely coded event icons are presented on a schedule at one time. If the schedule is cluttered or users require a high degree of precision, gridlines can be used to indicate the precise date and time; users can display or suppress the gridlines as desired.

12.3 Information Coding

12.3.1 Color

The effectiveness of color in information coding varies with the task being performed. Color has been found to be a more effective code than other cues such as shape, size, or brightness when performing search and symbol identification tasks. The performance advantage of color increases with the density of the symbols in a display and when the number of nontarget symbols of a different color than the target increases. However, color used excessively or inappropriately in displays can degrade user performance when compared to monochromatic displays, and the addition of color can increase response time and the likelihood of error due to color confusions.

If the application uses color coding, it is available as a redundant code and used only to provide required functionality; other coding methods (e.g., shape, size) are applied whenever possible. The number of colors used for coding in a alphanumeric display does not exceed seven, with only four codes displayed at any one time. The number of colors used for coding in a graphic display does not exceed nine. When users encounter information that is color coded, they are able to display the meaning of the code (e.g., view this information in the status bar). Slight shade changes in color are not used to show gradation or choice. If coding is based on shade changes in color, the shading is of sufficiently differing intensity as to be discriminable and is not used to indicate object selection or for control of the application.

If the application uses color coding to indicate status, it adheres to the following conventions:

Green/Blue = Operational/Normal/Noncritical
Yellow = Caution/Questionable
Red = Inoperative/Error

Section 10.2.4 provides examples of color use in coding tactical information. The application does not indicate a change in status by modifying the background color (e.g., in a window) since this type of change usually reduces text readability. Instead, the change is signaled by altering the color of an object (e.g, a box or circle) next to the text. Mayhew in Principles and Guidelines in Software User Interface Design provides the following ISO guidelines regarding color coding:

To denote:	Use:
Larger size	Saturated or bright colors
Smaller size	Desaturated or dark colors
Equal size	Colors equal in brightness
Heaviness	Saturated, dark colors
Lightness	Desaturated, light colors
Depth	Saturated, dark colors
Closeness	Saturated, bright colors
Height	Desaturated, light colors
Low-end continuum	Short-wavelength dark colors
High-end continuum	Long-wavelength bright colors

The DoD style guide provides the following additional guidelines on using color in computer display systems:[3]

- Highly saturated colors, opposing colors (e.g., yellow and blue), and colors at spectral extremes (e.g., yellow and purple) should not be used together because they can cause afterimages, shadows, and depth effects.

- Pure white text should not be displayed on a pure black background because this combination produces halation that makes the text less readable. Saturated blue should be used only for background features in a display and not for critical data or for small lines or dots when the background is dark.

- Color perception can be affected by both brightness and type of lighting (e.g., incandescent vs. fluorescent). For example, bright ambient light desaturates display colors and can result in degraded color identification and discrimination.

- At normal viewing distance, maximal color sensitivity is not reached until the size of a colored area exceeds about a three-inch square. Smaller size images become desaturated and change slightly in color. Also, small differences in actual color may not be discernible, and small adjacent colored images may be perceived to merge or mix.

- Color discrimination is better when color images are displayed on an achromatic background (black, gray, or white) and achromatic images are displayed on a color background. If color images are displayed on color backgrounds, then background and symbol colors should contrast in both brightness and hue to ensure legibility.

[3] More detailed guidelines on color use can be found in the DoD style guide.

12.3.2 Flash

If the application uses flash coding, it does so only to display urgent information for user attention. No more than two levels of coding are used. If one level of flashing is used, the flash rate is 3-5 Hz with equal on/off intervals; if two levels of flashing are used, the flash rate of the second level is 1-2 Hz, with equal on/off intervals. When flash coding is applied to a displayed item, a flashing symbol (such as asterisks) is used rather than flashing the text itself. Users are able to acknowledge the event causing the flashing and suppress it if desired.

12.3.3 Reverse Video

The application does not use reverse video to code application-specific information since it is used in Motif and MS Windows for highlighting (e.g., to indicate that an object has been selected). Reverse video can also reduce legibility and increase eye fatigue.

12.3.4 Size and Shape

If the application uses size coding, it limits the number of size codes to five or less,[4] and users are required to interpret relative size rather than absolute size. Care should be taken when using size and color coding together since users' perception of object size can be manipulated by varying the color saturation and lightness of the object.

If the application uses shape coding, it limits the number of shape codes to five or less, and the shapes used relate to the object or operation being represented. Although users are capable of distinguishing 15 or more separate shapes, the number of shape codes should be limited in order to support user performance in search and identification tasks. Simple geometric shapes (e.g., circle, triangle, square) should be used, with color and detail added only as required for users to identify the meaning assigned to the shape. If the application uses three-dimensional effects for shape coding, it ensures that the objects created are not confusable with standard interface components in Motif and MS Windows.

12.3.5 Sound

If the application uses auditory signals, it does so to alert users about critical conditions or operations. If auditory signals are associated with noncritical operations (e.g., as an alternate means of information presentation), they are used sparingly and users can acknowledge and turn off the signal at their discretion. Auditory signals are intermittent in nature and distinctive in intensity and pitch, and the number of signals provided to users does not exceed four. The intensity, duration, and source location of the signal are selected to be compatible with the acoustic environment of users and the requirements of other personnel in the surrounding area.

12.3.6 Typography

If the application uses variations in typography for coding, it provides no more than two font styles (e.g. regular and italics), two weights (e.g., regular and bold), or three sizes at one time.

[4] MIL-STD 1472E indicates that no more than three size levels shall be used.

The application can use capitalization for emphasis in text, but it is not the sole indication of critical information. While underlining can be effective in drawing user attention to specific text information, it can reduce legibility and so is used sparingly in the application.

12.4 Dynamic Information

If the application presents visual information that is updated automatically, it allows users to control the rate at which the information is updated. Users can freeze the display of any information that is being updated automatically and resume the updating either at the point of stoppage or at the current point in time. When users have to read dynamically changing information reliably and accurately, the update rate is no more than once per second. When users have to identify the rate of change or read gross values, the update rate is 2-5 times per second. The application prompts users to return to automatic updating after freezing a display (e.g., while users execute a print command) and informs them if significant changes occurred while the display was frozen.

The application provides similar capabilities when users interact with auditory information. Users can control the playback of auditory information (e.g., start, stop, pause) as well as adjust the volume of the playback.

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